

EUROPEAN COMPUTER DRIVING LICENCE

Syllabus, «IT Administrator» VERSION 1.0

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Target Population for «IT Administrator»

Computer sales are increased rapidly, their cost is being decreased and they become faster and faster. Modern computers and their new applications offer more and more functions and abilities to their user. Furthermore, more and more companies and public organizations all over the world are connecting their computers to Local Area Networks, LAN and Wide Area Networks, WAN. Using the Internet, the World Wide Web, WebPages and e-mail are now the basic characteristics of every modern businessman.

Knowing all the above it is reasonable to suggest that a "plain" user does not have the required knowledge, or the time to follow this evolution and to solve the technical problems that may occur. That is why every company or public organization that uses computers must have one or more IT Administrators who:

- ✓ Will operate as market consultants for buying hardware and software for the company
- ✓ Will put in function the computers and the peripherals the company buys
- ✓ Will work practically with computer hardware
- ✓ Will help and support the users in everyday problems
- ✓ Will operate as internal technicians with hardware, software, printers and local networks
- ✓ Will operate as "PC-doctors"
- ✓ Will follow up the evolution in order to assure the usage of new technologies by the company
- ✓ Will update the current hardware and software
- ✓ Will operate as middle men between the company and the hardware and software suppliers
- ✓ Will assure the safety of the company data by protecting them from loss, virus attack and hacking

The IT Administrator is a professional certificate, which verifies that a person is qualified to perform all the above.

In order to acquire this certificate, the candidate must pass the following five modules:

Module 1 Goals

Module 1 The **PC Hardware** module requires the candidate to know and recognise the basic physical make-up of a personal computer as well as their functions. Furthermore, he should be able to diagnose and repair the hardware problems that may occur. The candidate should be capable of working effectively, updating the hardware and operate as a market consultant for the hardware the company buys. Also, he should know and handle some utilities in order to diagnose and repair hardware problems at a Personal Computer.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
1.1 Introduction to Personal Computer	1.1.1 Basic Components	1.1.1.1	Understand the basic concepts of hardware and software
		1.1.1.2	Know the basic components of a PC
		1.1.1.3	Understand the basic function of a PC, input, processing, storage, output data
1.2 Motherboards	1.2.1 Function	1.2.1.1	Understand the role of a motherboard.
		1.2.1.2	Know the basic integrated functions of a motherboard
		1.2.1.3	Know the basic components of a motherboard, such as CPU slot/socket, chipset, cache memory, buses, ports, expansion slots etc
		1.2.1.4	Be able to identify the basic components of a motherboard
	1.2.2 Types and differences	1.2.2.1	Know the different types of motherboards and the differences between them, such as AT, LPX, ATX, NLX etc.
		1.2.2.2	Be aware of the different types of connectors each motherboard has
1.3 Microprocessors	1.3.1 Basic features	1.3.1.1	Know what is the main task of a CPU.
		1.3.1.2	Be aware of the terms: CPU speed, Overclocking, multiple factor. Also know the factors, which may affect them.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		1.3.1.3	Know the basic components and their function, such as core, registers, FPU, L1 cache, Buses etc
		1.3.1.4	Be aware of the factors that determine the processor's capacity.
		1.3.1.5	Know the difference between RISC and CISC architectures.
		1.3.1.6	Be aware of the different CPU voltages and how it can be regulated.
	1.3.2 Types and differences	1.3.2.1	Be aware of the different processor makers.
		1.3.2.2	Be aware of the different personal computers processors.
		1.3.2.3	Know the differences between different CPU's, their capacities and their limitations.
	1.3.3 Slots and Sockets	1.3.3.1	Understand and distinguish the difference between slots and sockets.
		1.3.3.2	Know the different slots and sockets that have been used. Know which of them are still in use.
	1.3.4 Packages	1.3.4.1	Be aware of the different CPU packages, such as DIPP, PGA, SPGA, SECC, PPGA, FC-PGA
		1.3.4.2	Know the advantages and disadvantages of the different CPU packages
		1.3.4.3	Know how to install all kinds of packages.
1.4 BIOS	1.4.1 Basic features	1.4.1.1	Know what BIOS is, where is it stored and its functions
		1.4.1.2	Understand the terms: POST, SETUP, CMOS, Firmware and their function.
		1.4.1.3	Know the basic settings we can adjust from BIOS SETUP.
		1.4.1.4	Know the most popular BIOS makers

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
	1.4.2 Upgrading	1.4.2.1	Know how to check the current BIOS version
		1.4.2.2	Know how and when to upgrade the BIOS.
		1.4.2.3	Be able to check or modify the settings in BIOS which concern PnP.
1.5 Cache Memory	1.5.1 Basic features	1.5.1.1	Understand the benefits of cache memory
		1.5.1.2	Know how cache memory works.
	1.5.2 Types of Cache	1.5.2.1	Know the different types of cache and their location.
		1.5.2.2	Know the differences between L1 and L2 cache.
		1.5.2.3	Know the differences between write back and write through cache.
		1.5.2.4	Know how disk cache works and the available program for its management.
1.6 Buses	1.6.1 Bus structure and bandwidth	1.6.1.1	Know what a bus is and its function.
		1.6.1.2	Know the structure of a bus. Address bus, data bus, control bus.
		1.6.1.3	Know the function of address bus, data bus, and control bus.
		1.6.1.4	Know how the bandwidth can affect an address bus
		1.6.1.5	Know how the bandwidth can affect a data bus
	1.6.2 Different types of buses	1.6.2.1	Be aware of the terms Front Side Bus and Back Side Bus.
		1.6.2.2	Know what I/O buses are and their function.
		1.6.2.3	Know the various I/O buses, such as ISA, MCA, EISA, PCI, PC-CARD, USB and Firewire. Know

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			the main differences between them.
		1.6.2.4	Know how different buses communicate (or cooperate) together.
1.7 System Resources	1.7.1 Understanding system resources	1.7.1.1	Know the basic system resources, such as I/O port addresses, IRQ's and DMA's.
		1.7.1.1	Know what I/O port addresses are and their function.
		1.7.1.2	Know what IRQ's are and their function.
		1.7.1.3	Know what DMA's are and their function.
		1.7.1.4	Know how the hexadecimal system work
	1.7.2 Manage system resources	1.7.2.1	Be able to check the used and available system resources.
		1.7.2.2	Be able to change system resources
		1.7.2.3	Be able to configure the system resources of new hardware.
1.8 Memory	1.8.1 RAM	1.8.1.1	Understand the terms RAM and ROM and know the differences between them.
		1.8.1.2	Know the difference between DRAM and SRAM.
		1.8.1.3	Know the different types of DRAM, such as DIPP, SIPP, SIMM, DIMM and RIMM. Also be aware of their function.
		1.8.1.4	Know the features of the different types of DRAM, such as speed, capacity etc.
		1.8.1.5	Understand the terms Parity and ECC memory, their function and why they are used.
		1.8.1.6	Be aware of the number of bits each type of DRAM memory uses. Also understand the term Banking

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
	1.8.2 ROM	1.8.2.1	Be aware of the function of ROM memory. Also know its features.
			Know the different types of ROM, such as PROM, EPROM, EEPROM and their features.
1.9 Floppy Disk	1.9.1 Function	1.9.1.1	Know how a floppy disk works.
		1.9.1.2	Understand the terms: tracks, sectors and clusters. Also know the relationship between them.
		1.9.1.3	Understand the way data is stored on a floppy disk.
		1.9.1.4	Know the different types of formatting a floppy disk and their difference.
		1.9.1.5	Know the different physical formats of a floppy disk and their capacities.
		1.9.1.6	Know the system resources a disk controller uses.
		1.9.1.7	Know the structure of a floppy disk, such as master boot record, FAT and root directory.
		1.9.1.8	Know how to install a floppy disk driver. Also know which cables are necessary and how to connect them.
		1.9.1.9	Know how many disk drivers a PC can handle and how to configure them using the BIOS settings.
1.10 Hard disk	1.10.1 Function	1.10.1.1	Know how a hard disk works.
		1.10.1.2	Understand the geometry of a hard disk, such as plates, heads and cylinders. Also understand the term CHS.
		1.10.1.3	Know the translation methods ECHS and LBA and the differences between them.
	1.10.2 IDE interface	1.10.2.1	Know the different hard disk interfaces, such as IDE, IDE2 and SCSI I, II and III.

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		1.10.2.2	Be aware of the way IDE interface works, their limitations and their capacities.
		1.10.2.3	Know the different types of IDE, such as ATA/33, ATA/66, ATA/100
		1.10.2.4	Understand the terms: Primary IDE, Secondary IDE, Master and Slave.
		1.10.2.5	Know how many IDE hard disk drives can a PC handle and how to configure them using the BIOS settings.
	1.10.3 SCSI	1.10.3.1	Know how the SCSI interface works and its differences, comparing to IDE.
		1.10.3.2	Understand the terms Host adapter, SCSI ID, LUN, Terminator and ASPI.
		1.10.3.3	Know the main types of SCSI, their capacities and limitations.
		1.10.3.4	Know how many SCSI devices a SCSI chain can handle and how to configure them.
		1.10.3.5	Be able to recognize the different SCSI cables and connectors. Also know how to connect SCSI devices to them.
	1.10.4 Hard disk structure	1.10.4.1	Understand the terms Low level format, Partition, High level format.
		1.10.4.2	Know how to partition a hard disk. Also know the terms Logical drives and Active partition.
	1.10.5 File systems	1.10.5.1	Know what a file system is and its function.
		1.10.5.2	Know the most common file systems and the operating systems that use them.
1.11 Video Display	1.11.1 Monitor	1.11.1.1	Be aware of the most common monitor types, such CRT and TFT and how they work.
		1.11.1.2	Be aware of the factors, which can determine the image quality, such as resolution, refresh rate,

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			number of colours.
	1.11.2 Graphics adapter	1.11.2.1	Be aware of the most common modes of resolution, such as VGA, SVGA, and XGA.
		1.11.2.2	Be aware of the most important components of a graphics adapter, such as GPU, memory, Video BIOS, RAMDAC and their function.
		1.11.2.3	Be aware of the most common video memory types, such as SDRAM, VRAM, WRAM, SGRAM and DDR SDRAM. Also know the differences between them and their advantages.
		1.11.2.4	Know what AGP is, its function and its advantages.
1.12 Printers	1.12.1 Types	1.12.1.1	Be aware of the different printing technologies, such as dot- matrix, inkjet and laser.
		1.12.1.2	Know how a dot – matrix printer works, its benefits and limitations.
		1.12.1.3	Know how an inkjet printer works, its benefits and limitations.
		1.12.1.4	Know how a laser printer works, its benefits and limitations.
	1.12.2 Installing and managing	1.12.2.1	Be aware of the different ways in which a PC can communicate to a printer, such as parallel, serial and USB.
		1.12.2.2	Be aware of the different parallel ports, such as standard, ECP and EPP. Also know the differences between them.
1.13 Power Supply	1.13.1 Types and function	1.13.1.1	Know the function of a power supply.
		1.13.1.2	Know the different types of power supply, such as AT and ATX.
		1.13.1.3	Know the different connections to peripherals, their names and their appearance. Also know the different voltage in the wires.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		1.13.1.4	Understand the terms Volt, Ampere, Ohm, Watt, alternating current and direct current.
		1.13.1.5	Know what a surge protector is and how it works.
	1.13.2 ESD	1.13.2.1	Know what Electrostatic Discharge (ESD) is and when it occurs. Also know the damage it causes.
		1.13.2.2	Know how to protect your hardware from ESD damage. Also know how the weather conditions affect the ESD.
	1.13.3 UPS	1.13.3.1	Know what UPS is and its function. Also know how the different types of UPS work and communicate with a PC.
1.14 Installation of new hardware	1.14.1 Install and replace hardware	1.14.1.1	Be able to install and replace a basic component, such as CPU, memory, power supply, motherboard, hard disk, graphics adapter, etc.
		1.14.1.2	Be able to install a second hard disk or CD-ROM and configure it. Also be able to create and manage several partitions.
		1.14.1.3	Be able to install expansion cards, such as sound card, network interface card etc.
		1.14.1.4	Be able to install a modem or other communication devices.
		1.14.1.5	Be able to install SCSI host adapter and SCSI devices and configure them. Also be able to install and configure other peripheral devices, such as scanners, printers, external backup stations etc
1.15 Diagnosing and Troubleshooting	1.15.1 Diagnose and troubleshoot hardware problems	1.15.1.1	Be able to recognise any error message during start up. Also know what to do to resolve the problem.
		1.151.2	Be able to recognise an error message from a basic component.
		1.15.1.3	Be able to check the available installed hardware and its configuration. Also be able to create the necessary documentation.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		1.15.1.4	Be able to check the used resources, such as I/O addresses, IRQs and DMAs.
		1.15.1.5	Be able to check for resource conflict, using an available diagnostic program. Also, know what to do if resource conflict occurs.
		1.15.1.6	Know how to test weather a Power supply works effectively.
		1.15.1.7	Be able to recognise a printer error message. Also know what to do to resolve the problem.

Module 2 Goals

Module 2 Module 2, **Operating systems**, requires the candidate to be familiar with the procedure of installing and updating the most common operating systems and applications. The candidate should be able to repair software problems that may occur and to help and support the users in their everyday problems. Also, he/she should know and handle the system tools, which are included in most operating systems and diagnose any problems at a PC system, in order to repair the software problems.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM	
2.1 Operating System Fundamentals	2.1.1 Basic function	2.1.1.1	Understand the function of an operating system. Also know its use.	
		2.1.1.2	Know the most common operating systems for the PC family. Also know the basic differences between them.	
		2.1.1.3	Be aware of the most common operating systems capabilities and limitations. Also know the compatibility between them.	
2.2. Install Operating System	2.2.1 Installation process	2.2.1.1	Know the different ways to install an operating system, such as installation from CD-ROM, network etc	
		2.2.1.2	Keep up to date with the minimum requirements of common operating systems installation.	
	2.2.2 Dual operating system	2.2.2.1	Be able to install two or more operating systems in a PC.	
		2.2.2.2	Understand the start process when dual operating systems are installed. Also know which files are used during startup and their functions.	
		2.2.2.3	Be aware of the term Boot Menu and when it is used. Also, be able to view and change boot menu settings.	
	2.3 Operating System Organization	2.3.1 Boot Process	2.3.1.1	Know which files are being used during the boot up process. Also know their function.
			2.3.1.2	Know from which directory the boot files are loaded.
2.3.1.3			Know which boot files should be in a start up disk and their functions.	

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		2.3.1.4	Know how to create a start up disk.
2.4 Using, configure and upgrade the operating system	2.4.1 Operating system interface	2.4.1.1	Understand the operating systems interface.
		2.4.1.2	Be able to use the operating systems interface. Know how to create and remove all kinds of shortcuts, change icons, etc.
		2.4.1.3	Be able to use the available accessories. Also be able to install and remove them.
	2.4.2 Configure the environment	2.4.2.1	Know how to configure and change monitor settings, such as Colours, Resolution, and Refresh Rate. Also know how to change monitor and graphic adapter drivers.
		2.4.2.2	Know how to configure the desktop, using the available utilities, to create a personal environment. Change background, themes, taskbar settings etc.
		2.4.2.3	Know how to configure and change mouse and keyboard settings.
		2.4.2.4	Know how to configure and change Multimedia.
		2.4.2.5	Know how to configure and change Regional settings
		2.4.2.6	Know how to install and remove fonts.
		2.4.2.7	Know how to add, modify and remove a printer. Also, know how to set a printer as default if possible, check a printer's status and upgrade its drivers.
		2.4.2.8	Know how the operating system organizes its folders/directories. Know where system files, application files, temporary files, internet files etc are stored.
	2.4.3 Configuration files	2.4.3.1	Be aware of the files, which contain the configuration information. Also know their name and location.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		2.4.3.2	Be able to use a utility to check and modify the configuration files.
		2.4.3.3	Know how to protect the configuration files. Also know how to take backup and restore them.
	2.4.4 Upgrading	2.4.4.1	Be able to upgrade to a newer version of the operating system.
2.5 Disk management	2.5.1 Managing files and folders	2.5.1.1	Be aware of the available disk administration utility. Also be able to use it.
		2.5.1.2	Be aware of the available partitioning program
		2.5.1.3	Know how to create, format and activate a partition.
		2.5.1.4	Know what a cluster is and which factors determine its size.
	2.5.2 File system	2.5.2.1	Know the most common file systems your operating system can use.
		2.5.2.2	Be able to choose the appropriate file system for an operating system.
		2.5.2.3	Know how to convert from a file system to another and if and when it is useful.
		2.5.2.4	Know the file and directory attributes and their function.
	2.5.3 Disk cache	2.5.3.1	Know what Disk cache is and how to manage it if it is possible
2.6 Disk maintenance	2.6.1 Optimise disk performance	2.6.1.1	Be able to use an available utility to test the disks. Also, be able to repair any problem.
		2.6.1.2	Know what fragmentation is and why it occurs.
		2.6.1.3	Know what defragmentation is. Also be able to use a utility to perform defragmentation if needed.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		2.6.1.4	Be able to use an available utility to remove unwanted files from a disk if needed. Also know what kind of files these may be.
2.7 Memory	2.7.1 Memory Management	2.7.1.1	Know the maximum memory the operating system can manage.
		2.7.1.2	Know the available utility that monitors the memory, and its functions.
	2.7.2 Virtual memory	2.7.2.1	Be aware of the term Virtual memory and its use.
		2.7.2.2	Know where virtual memory will be put, its size and restrictions.
2.8 Install new Hardware and Software	2.8.1 Hardware installation	2.8.1.1	Be able to check the available installed hardware and its configuration. Also be able to create the necessary documentation.
		2.8.1.2	Be able to check the used resources, such as I/O addresses, IRQs, DMAs.
		2.8.1.3	Be able to check for resource conflict. Also, know what to do if resource conflict occurs.
		2.8.1.4	Be able to install, remove and update hardware device drivers, using different sources.
	2.8.2 Plug and Play	2.8.2.1	Know what the term Plug and Play means and understand its function. Also be aware of the requirements for PnP.
		2.8.2.2	Know how to install a PnP device. Also know how to install non-PnP devices.
	2.8.3 Software installation	2.8.3.1	Be able to install, upgrade and uninstall application software.
2.9 External Communication	2.9.1 Internet connection	2.9.1.1	Know how to install and use a modem. Also, know how to update modem drivers.
	2.9.2 Internet browser	2.9.2.1	Know how to install, configure and use Internet browser software.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		2.9.2.2	Be able to check and change general settings, such as delete temporary internet files, clean history etc
	2.9.3 Mail software	2.9.3.1	Be able to install and use mail software.
		2.9.3.2	Be able to configure the mail software, such as POP3, IMAP, HTTP, News server etc
	2.9.4 Network	2.9.4.1	Know how to install a Network Interface Card, NIC. Also, know how to update NIC drivers
		2.9.4.2	Be able to configure a NIC.
		2.9.4.3	Know how to install and configure a network protocol, such as TCP/IP.
2.10 Checking performance and monitoring events	2.10.1 Performance	2.10.1.1	Be able to use the available utility to monitor the hardware and software performance.
		2.10.1.2	Be able to select single device or task and monitor their performance
		2.10.1.3	Be able to monitor the available performance status, such as total and free memory, virtual memory in use, available resources, etc
		2.10.1.4	Be able to monitor the active tasks and processes
	2.10.2 Events	2.10.2.1	Be able to monitor the events, system log, using the available utility
2.11 Diagnosing and Troubleshooting	2.11.1 Diagnosing and Troubleshooting	2.11.1.1	Be able to use the available diagnostic programs to analyse the current hardware and software settings.
		2.11.1.2	Recognize the most common error codes. No OS Found,
		2.11.1.3	Diagnose and know what to do if the operating system don't start
		2.11.1.4	Be able to diagnose and repair problems during the start up process

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			the start up process.
		2.11.1.5	Be able to diagnose and repair communication problems, such as modem and internet communication problems.
		2.11.1.6	Diagnose and repair configuration files problems.
		2.11.1.7	Diagnose and repair local printing problems.
		2.11.1.8	Be able to start a computer in safe mode
		2.11.1.9	Be able to make and use a repair disk, emergency disk, for recovery. Also, know the way the disk works.

Module 3 Goals

Module 3 Module 3, *Local Area Network and Network Services*, requires the candidate to be familiar with the procedure of installing, using and managing a local area network. He/She should be able to add and remove users and shared resources. The candidate should be able to repair the network problems. Also, he/she should know how to manage the system tools, which are included in most LAN operating systems, in order to repair the problems that may occur.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
3.1 Network Fundamentals	3.1.1 Network components	3.1.1.1	Know the basic components of a network, such as server, client, NIC, protocols, Network Operating System (NOS), shared resources
		3.1.1.2	Understand the role of a Server, its requirements, and function. Also know the basic server components and be able to built or order a server, so that it covers the network needs.
		3.1.1.3	Understand the role of a Client, its requirements, and function. Also know the basic client components and be able to built or order a client, so that it covers the user and the applications needs.
		3.1.1.4	Understand the function of a Network Interface Card, NIC. Also be able to choose the appropriate card for a network
	3.1.2 Topology	3.1.2.1	Understand the basic topologies Busnet, Ringnet, Starnet and the differences between them. Know their function, capabilities and limitations.
		3.1.2.2	Understand and distinguish between types of Network Cables, that can be used, such as coaxial, twisted pair, fiber optic. Know their capabilities and limitations.
		3.1.2.3	Understand and distinguish between network architectures, such as Ethernet, Token ring, Fiber Distributed Data Interface (FDDI).
		3.1.2.4	Know the different types of Ethernet networks, such as 10BASE-2, 10BASE-5, 10BASE-T
		3.1.2.5	Be able to recognize the different Network adapter Connectors, Coax/BNC, DIX/AUI/DB15, RJ45 etc. Also know their use.
	3.1.3 Types of Network	3.1.3.1	Know the definitions of Local Area Network, LAN and Wide Area Network, WAN.
		3.1.3.2	Understand and distinguish between Internet and Intranet. Know how Intranet works.
		3.1.3.3	Understand and distinguish between Peer to Peer and Domain based Networks.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
3.2 Installation and Configuration	3.2.1 Installation and Configuration of a NIC	3.2.1.1	Be able to install a NIC or replace a damaged one.
		3.2.1.2	Be able to check and configure a NIC and set resources such as I/O Addresses, IRQs etc
		3.2.1.3	Be able to install and update drivers for a NIC
	3.2.2 Network Protocol	3.2.2.1	Know the most common protocols such as TCP/IP, IPX/SPX, NetBEUI, HTTP, and FTP. Also know what MAC address is.
		3.2.2.2	Be able to install, configure and activate a protocol. Also be able to bind a protocol to a NIC.
		3.2.2.3	Know the structure of a TCP/IP protocol and its properties, such as IP address, WINS Configuration, Gateway and DNS Configuration.
3.3 Manage users and groups accounts	3.3.1 Add and remove users and groups	3.3.1.1	Understand and distinguish between the different user and group types an operating system uses.
		3.3.1.2	Know how to add a new user or group. Also, know how to add a new user to a group.
		3.3.1.3	Know how to remove a user or group. Also, know how to remove a user from a group.
	3.3.2 Set Properties	3.3.2.1	Know how to identify user properties, such as logon time, profile, etc
		3.3.2.2	Know how to change user properties, such as password, logon time, profile etc
		3.3.2.3	Know how to identify group properties, such as group members etc
3.4 Create and manage shared resources and account permissions	3.4.1 Create shared resources	3.4.1.1	Know what shared resources are and be aware of their benefits.
		3.4.1.2	Know how to create shared resources, such as file resources, printer resources and modem resources.
		3.4.1.3	Be able to check the available shared resources in a network. Also know how to check which users use shared resources at any time and control the permissions to shared resources.
	3.4.2 Remove shared resources	3.4.2.1	Know how to remove shared resources, such as file resources and print resources
		3.4.2.2	Know how to disconnect users from a shared resource.
	3.4.3 Logical Network Drives	3.4.3.1	Be aware of the term network logical drive.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		3.4.3.2	Understand the process of connecting a logical network drive to a shared resource.
		3.4.3.3	Understand the process of connecting a client to a shared print resource, using a logical print port.
		3.4.3.4	Know how to connect a client to a shared resource on a server or other clients.
	3.4.4 Manage account permissions	3.4.4.1	Understand the permissions for shared resources the network operating system can use.
		3.4.4.2	Be able to set, remove and modify permissions for a user or a group
		3.4.4.3	Be able to check the login users. Also know how to logout user from the network.
3.5 Installing software	3.5.1 Install Operating System	3.5.1.1	Know the most common network server and client operating system.
		3.5.1.2	Be able to install and configure an operating system on a server.
		3.5.1.3	Install, configure and remove network services on a server
		3.5.1.4	Be able to install, configure and remove network services on a client.
	3.5.2 Install and remove applications	3.5.2.1	Be aware of the process of program installation in a common shared resource
		3.5.2.2	Know how to upgrade application software in a shared resource.
		3.5.2.3	Know how a user can connect and use a program in a shared resource.
3.6 Manage Network Printers	3.6.1 Installing and managing printers	3.6.1.1	Know how to install a network printer
		3.6.1.2	Know how to connect and use a shared printer and control their permissions
		3.6.1.3	Know how to check the printer status (print queue status)
		3.6.1.4	Know how to cancel or pause a print job. Also know how to reorder it if possible.
3.7 Security and protection	3.7.1 Backup	3.7.1.1	Understand the importance of creating backups.
		3.7.1.2	Know how to schedule backups, using the available utilities and an external storage device.
		3.7.1.3	Know how to recover backup files

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
3.8 Utilities	3.8.1 Administrative Tools	3.8.1.1	Know how to use the available utility for managing users and groups.
		3.8.1.2	Know how to monitor the server performance
		3.8.1.3	Be aware of the shared resource manager utilities
	3.8.2 Disk administration utility	3.8.2.1	Be aware of the available disk administration utility. Also know how to create, format and activate a partition etc.
		3.8.2.2	Configure, monitor and manage file systems
		3.8.2.3	Be able to recognize the file system OS is using and know how to convert from one file system to another file system if applicable.
		3.8.2.4	Be aware of the term RAID and their benefits. Also know the most common used RAID types, such as RAID0, RAID1 and RAID5.
		3.8.2.5	Know how to install, recover and manage a RAID system.
	3.8.3 Network utilities	3.8.3.1	Be able to use network utilities to configure manage and trace network usage.
3.9 Sharing Internet Services.	3.9.1 Installing Services	3.9.1.1	Know how to install configure and manage a simple mail server.
		3.9.1.2	Know how to install configure and manage a simple web service.
3.10 Internet connections	3.10.1 Modem communication	3.10.1.1	Be aware of the function of a modem. Also know what the terms modulation, demodulation, DTE and DCE mean.
		3.10.1.2	Be aware of the three basic encoding techniques, ASK (Amplitude-Shift Keying), FSK (Frequency Shift Keying) and PSK (Phase-Shift Keying). Also know the QPSK (Quadrature Phase-Shift Keying).
		3.10.1.3	Be aware of the most common modem protocols such as, XMODEM, YMODEM, ZMODEM, KERMIT etc
		3.10.1.4	Be aware of the most common modem communications standards, such as V.90, V.42 etc
		3.10.1.5	Know how flow control Hardware (RTS/CTS) and Software (XON/XOFF) works
		3.10.1.6	Be aware of the most common modem commands such as AT, ATZ, ATD, ATH etc

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			commands such as AT, ATZ, ATD, ATH etc
		3.10.1.7	Know how data transfers via a modem. Also know the difference between BPS and Baud and when they are used.
		3.10.1.8	Know what UART does. Also know the different types of UART and their features
	3.10.2 ISDN-communication	3.10.2.1	Know how ISDN-communication works and its benefits
		3.10.2.2	Know the different types of ISDN and the differences between B- and D channel
	3.10.3 DSL-communication	3.10.3.1	Know how DSL- technology works and its benefits
		3.10.3.2	Know the different types of DSL, such as ADSL, HDCL, SDSL and VDCL. Also know the differences between them
	3.10.4 Sharing Internet Connections	3.10.4.1	Know how to create and configure a local proxy.
3.11 Configuration and Upgrading	3.11.1 Configuration	3.11.1.1	Be able to check the current server configuration and create documentation for it.
		3.11.1.2	Be able to check the current client configuration and create documentation for it.
	3.11.2 Upgrading	3.11.2.1	Know how to upgrade operating system of both a client PC and Server
3.12 Diagnosing and Troubleshooting	3.12.1 Diagnose and resolve problems	3.12.1.1	Be able to use the available diagnostic utilities
		3.12.1.2	Be capable of troubleshooting problems with hardware
		3.12.1.3	Be able to diagnose the reason why a user cannot gain access to the network. Also locate the source of the problem (server, cable, NIC, drivers, etc)
		3.12.1.4	Be capable of diagnosing and troubleshooting user permissions. Why can't a user save or use a shared resource;
		3.12.1.5	Be capable of diagnosing and troubleshooting local and domain user accounts, if any domain is available.
		3.12.1.6	Be able to diagnose printing problems
		3.12.1.7	Be able to diagnose hardware problems such as problems with the cable, NIC, etc

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		3.12.1.8	Be capable of diagnosing and troubleshooting the TCP/IP protocol
		3.12.1.9	Be capable of diagnosing and troubleshooting performance problems

Module 4 Goals

Module 4 The Module **Expert Network Use** requires the candidate to know the various ways of communication, interconnectivity between LANs and advanced data communications, in order to choose the best solution for his company. Furthermore, he should be able to diagnose and repair network communication problems that may occur. The candidate should be capable of recognising the different solutions that can be used for data communication, so that he can choose the best way to cover his company needs.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
4.1. Networking: a historical introduction	4.1.1 Architectures	4.1.1.1	From hierarchical to distributed systems; the client-server approach
	4.1.2 Communication protocols	4.1.2.1	De facto and de jure standards: the TCP/IP suite and the OSI model; standard organizations (CCITT, ITU-TS, IEEE, ISO, IAB)
4.2. The OSI reference model	4.2.1 Description of the reference model layers	4.2.1.1	Illustrate the purpose of the layered reference model (principle of encapsulation and service access points in layer models). Know the main standard organisations, such as CCITT, ITU-TS, IEEE, ISO and IAB. Also know the domain they are focusing.
		4.2.1.2	Describe the aim of the different layers (physical, data link, network, transport, session, presentation, and application)
4.3. Physical Layer	4.3.1 Data types and signalling	4.3.1.1	Describe the properties of analog and digital signals
		4.3.1.2	Distinguish bits and bytes in digital binary signals
	4.3.2 Data transmission	4.3.2.1	Illustrate the main bounded (copper cables and fiber optic cables) and unbounded (microwave, radio, infrared, laser, satellite) media
		4.3.2.2	Describe structured cabling systems (behaviour, use and benefits), components (plug, sockets, patch-cords, racks, etc.), and non-certificated add-ons
		4.3.2.3	Illustrate the main network topologies (bus, star, ring, tree)

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			star, ring, tree)
		4.3.2.4	Distinguish communication modes (simplex, half-duplex, full duplex) and transmission types (asynchronous, synchronous, serial, parallel).
		4.3.2.5	Be aware of the terms start bit, stop bit, parity and data bit. Also know where they are being used. Be aware of the terms SYNC, STX, ETX, ACK and NACK. Also know where they are used
		4.3.2.6	Define channels and bandwidths
	4.3.3 Ethernet	4.3.3.1	Describe Ethernet systems: data transmission rates, transmission media, and maximum lengths and nodes
	4.3.4 Token ring	4.3.4.1	Illustrate the token ring architecture (topology, physical layer media and data transmission rates)
	4.3.5 Fiber Distributed Data Interface (FDDI)	4.3.5.1	Describe a FDDI network system (structure, data rate and distance limits)
	4.3.6 Asynchronous Transfer Mode (ATM) and Frame Relay.	4.3.6.1	Define ATM logical connections (transmission path, virtual path, virtual channel)
		4.3.6.2	Define Frame Relay logical connections (virtual circuit, permanent virtual circuit, datalink connection identifier, multilink frame relay, aggregated virtual circuit)
		4.3.6.3	Indicate the range of data transmission rates in ATM systems and Frame Relay systems
	4.3.7 Wireless LAN	4.3.7.1	Indicate the transmission media and techniques for wireless LANs (infrared, spread spectrum, narrowband microwave) and their range of operation
		4.3.7.2	Know interoperability tips in wireless broadband systems(WiFi standard, bluetooth, 802.11).

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
	4.3.8 Networking: repeaters and hubs	4.3.8.1	Describe the function of a hub and a repeater
4.4. Datalink layer	4.4.1 General	4.4.1.1	Describe circuit and packet switching concepts
		4.4.1.2	Explain the CSMA/CD operations
		4.4.1.3	Describe the access to a token ring: medium access control protocol, pros and cons of a token passing system
		4.4.1.4	Illustrate the medium access control in a FDDI system
		4.4.1.5	Distinguish cells from packets
		4.4.1.6	Illustrate the ATM layer functions (switching, multiplexing, routing, congestion management)
		4.4.1.7	Illustrate the FR layer functions (switching, multiplexing, routing, congestion management)
	4.4.2 PPP	4.4.2.1	Describe the purposes and the operations of PPP, and the differences between PPP and SLIP
	4.4.3 Bridges and switches	4.4.3.1	Describe the function of a switch and a bridge
4.5. Network layer	4.5.1 Network protocols	4.5.1.1	Explain the purpose of an addressing system
		4.5.1.2	Illustrate the aims of IP protocol
		4.5.1.3	List the functions of ICMP, DHCP, and ARP protocols
	4.5.2 IP addressing	4.5.2.1	Describe the IP addressing scheme, the relationship between IP addresses and network classes, subnetting and CIDR concepts

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
	4.5.3 Networking devices: routers and layer-3 switches	4.5.3.1	Distinguish logical from physical addresses
		4.5.3.2	Describe the aims of a router, and the function of a layer-3 switch
4.6. Transport layer	4.6.1 Transport layer basics	4.6.1.1	Give a definition of port, well-known-port, and connection
	4.6.2 Transport layer protocols	4.6.2.1	Describe the purposes of TCP protocol, its main mechanisms (PAR, flow control, multiplexing, urgent data signalling, etc.), and the features of UDP protocol underlining its differences from TCP
		4.6.2.2	Describe main principles of Apple sharing services (AFP,...)
		4.6.2.3	Describe main principles of Novell IPX/SPX protocols
		4.6.2.4	Comparison between different protocols and their interoperability
	4.6.3 VLAN	4.6.3.1	Define what a VLAN is and list its pros and cons
	4.6.4 Transport security	4.6.4.1	Illustrate the purposes of Network Address Translation (NAT)
		4.6.4.2	Illustrate the purposes of (address) proxy
		4.6.4.3	Explain the aim of a firewall and its functions
4.7. Presentation layer	4.7.1 Data coding standards	4.7.1.1	Know ASCII, ANSI and UNICODE standards, the ASCII limits on national languages (concept of character set), computers internal data encoding (binary files vs. text files, text files EOL encoding in DOS/Windows, Apple and Unix/Linux system), and computers internal number encoding (big endian vs. low endian, canonical representation)
	4.7.2 MIME protocol	4.7.2.1	MIME protocol as a way to manage different objects.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
	4.7.3 Other non binary formats	4.7.3.1	List compressed formats (Hqx, Bin), the purposes of file compression and the main standards for known platforms (ZIP, GZ, ARC for DOS/Windows; SIT, CPT for Macintosh; GZ, Z, TAR, ZIP for Unix)
4.8. Session layer	4.8.1 Session establishment: parameter negotiation	4.8.1.1	RAS & PPP/SLIP negotiation phase hints
4.9. Applications	4.9.1 Network applications: TELNET and FTP	4.9.1.1	Illustrate the purposes of TELNET
		4.9.1.2	Describe the purposes of FTP protocol
	4.9.2 Remote resources on the Web	4.9.2.1	Give the definition of URL
		4.9.2.2	Illustrate the aim and the operations of Domain Name System (DNS)
		4.9.2.3	Describe the purposes of HTTP and S-HTTP protocols
		4.9.2.4	Explain cookies, their benefits and dangers
		4.9.2.5	Describe http content-type headers vs MIME standard
		4.9.2.6	Describe the aim of main markup languages (HTML, SGML, XML, CSS, XSL) and style sheet
		4.9.2.7	Illustrate the purposes of a gateway
	4.9.3 Electronic mail	4.9.3.1	Describe SMTP and its components (sender, protocol, receiver)
		4.9.3.2	Describe e-mail addresses structure
		4.9.3.3	Illustrate the purpose of POP3 & IMAP protocol

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		4.9.3.4	Know data transmission limitation with SMTP (large sized e-mail, ...)
		4.9.3.5	Illustrate the purposes of MIME and its extensions with respect to SMTP
	4.9.4 Groupware applications	4.9.4.1	Describe chat and messaging systems
		4.9.4.2	Describe the purposes and uses of mailing lists
		4.9.4.3	Describe the purposes and uses of Usenet and newsgroups
		4.9.4.4	Describe the purposes and uses of forums
		4.9.4.5	Describe the purpose of Netiquette: what to do and not to do with e-mail and newsgroups
	4.9.5 Access control and sharing	4.9.5.1	Describe the DAC, MAC, RBAC policies, the purposes of file sharing, the different permission levels, and the concepts of login and logon-script
		4.9.5.2	Illustrate different types of shareable objects: files, folders, printers, modems,...
		4.9.5.3	Describe the purposes of NetBIOS, NETBEUI, SMB and CIFS protocols (principle of operations, main features and differences), the server browsing operation, the master browser elections and operations, and sharing services (main differences between them, encapsulation level in Ethernet vs. IP)
	4.9.6 Innovative applications	4.9.6.1	Give a definition of interoperability and illustrate different approaches to it (standard interfaces, brokers)
		4.9.6.2	Illustrate the main features of a thin client
	4.9.7 Network control	4.9.7.1	Define the aim of SNMP protocol, the purpose of a network manager and a SNMP agent

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
4.10. Low level configuration	4.10.1 Describe how to connect a computer to a network	4.10.1.1	Connect a computer to a Ethernet segment (10Base5, 10Base2, 10BaseT, 100BaseT, 100BaseF); connect in cascade hubs or switches using crossed ports, crossed cables or coax cables
		4.10.1.2	Connect a computer to a token ring network
	4.10.2 Describe how to install a network card into a computer	4.10.2.1	Know installation constraints: health, security, warranty, technical approval
		4.10.2.2	Know main card bus types, their differences and distinguish the PC bus type.
		4.10.2.3	Automatic card recognition systems: principle of operation of PCMCIA, USB, FireWire.
		4.10.2.4	Insert cards in a computer
	4.10.3 Device drivers	4.10.3.1	Install network card driver on different platforms (Windows, Apple, Linux)
		4.10.3.2	Install Novell device drivers on Windows workstation server
	4.10.4 IP configuration	4.10.4.1	Obtain IP base parameters: IP number, IP Mask, Default gateway, DNS server(s)
		4.10.4.2	Configure IP base parameters on different platforms (Windows, Apple, Linux)
	4.10.5 Novell configuration	4.10.5.1	Configure access to Novell network from Windows systems
		4.10.5.2	Describe Novell IP tunnelling
	4.10.6 Netbios, NETBEUI, SMB, CIFS configuration	4.10.6.1	Install Ethernet- and IP-encapsulated sharing services on Windows and Linux/Unix platforms
		4.10.6.2	Setup validation level (user vs share)

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
4.11. Network services usage and configuration	4.11.1 Web Browser setup	4.11.1.1	Main browser setup (proxy, plugin, etc.)
	4.11.2 E-mail setup	4.11.2.1	Configure e-mail accounts and related items (POP or imap server, SMTP server, etc.)
	4.11.3 Advanced e-mail use	4.11.3.1	Configure e-mail automatic handling rules
		4.11.3.2	Setup coding rules (HTML vs text)
		4.11.3.3	Access and use webmail applications
	4.11.4 FTP usage	4.11.4.1	Use a FTP program for simple file transfers (connect as normal user or guest, change and list directories on local and remote computer, set passive mode; send / receive one or multiple files using binary and/or ASCII transfer)
	4.11.5 Object sharing	4.11.5.1	Access shared objects (disks, directories, modem, printers) using Windows, Apple Macintosh, Linux/Unix; stop network printing
		4.11.5.2	Activate/deactivate automounting of shared objects using Windows or Apple Macintosh
		4.11.5.3	Share disks, directories, printers and modems using Windows, Apple Macintosh, Linux/Unix, Novell
		4.11.5.4	Use sharing services through VLAN over Internet
4.12. Troubleshooting & testing	4.12.1 Physical connections	4.12.1.1	Use heartbeat and related loop led indicators
	4.12.2 IP testing	4.12.2.1	Use ICMP to test network (method and its limitations): the "ping" command to test server reachability and the network behaviour under stress
	4.12.3 Service testing	4.12.3.1	Use the "ping" command to test name lookup

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		4.12.3.2	Use "nslookup" related commands & programs to test DNS operations
		4.12.3.3	Use the "route" command to verify packet outcoming
		4.12.3.4	Use the "tcpdump" to monitor packets
		4.12.3.5	Use the "traceroute" command to check how packets reach a given server
	4.12.4 Protocols verifying	4.12.4.1	Use the "nslookup" MX query to discover mail servers
		4.12.4.2	Use the Telnet program to manually simulate SMTP simple session, verify existence of an account, and send an email
		4.12.4.3	Use the Telnet program to simulate a POP3 / IMAP session and get a list of pending messages
		4.12.4.4	Use the Telnet program to simulate a HTTP session and download a page to test server operations
4.13. Legal	4.13.1 Cabling	4.13.1.1	Illustrate structured cabling regulations and warranties
	4.13.2 Wireless	4.13.2.1	Describe European and national wireless LAN regulations (ETSI2)
	4.13.3 Job safety	4.13.3.1	Know safety on job as in relevant local regulations (example, Italian 626 regulation)
4.14. Basic security Issues	4.14.1 Network security	4.14.1.1	Illustrate the main security requirements (confidentiality, integrity, availability...)
	4.14.2 Cryptography	4.14.2.1	Explain the principles of private and public key encryption
	4.14.3 Browser security	4.14.3.1	Distinguish a secure connection from an insecure one and when it is necessary to use a secure transaction

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		4.14.3.3	Enable and disable cookies, ActiveX, Java, and JavaScript

Module 5 Goals

Module 5 Module 5, **Security**, requires the candidate to be familiar with the various ways of protecting data both in a single PC and in a LAN with internet connection. More specifically the candidate should be able to protect the company data from loss, virus attack and hacking. Also he/she should be able to know and handle the most common utilities and programs designed for this purposes.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
5.1. General	5.1.1. Basic concepts	5.1.1.1	Know what are the main aspects of information security (confidentiality, integrity, availability, all referred to information and/or systems resources).
		5.1.1.2	Know what are the main issues involved in risk assessment (value of information, vulnerability, threat, hazard, violation, impact, level of risk).
		5.1.1.3	Know the most common classification of technical mean to control the risk (identification and authentication, access control, accountability, audit, object reuse, accuracy, reliability of service, secure data exchange).
		5.1.1.4	Know what are the main processes to be implemented in an organization aiming at achieving information security (roles and responsibility definition, security policy definition, risk analysis, selection of technical, organizational and procedural measures, including continuity plans and disaster recovery plans).
		5.1.1.5	Know responsibilities of all the roles involved in an organization, (security officers, system administrators, everyday users)
		5.1.1.6	Know how to participate in an Incident Response Team (IRT).
		5.1.1.7	Know the distinction between functionality and assurance, and the importance of achieving both of them to control the risk.
		5.1.1.8	Know the availability of a methodology to assess different levels of assurance (ITSEC, ISO/IEC 15408).

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		5.1.1.9	Know the essence of a published standards (ISO/IEC 17799, BS 7799 part 2) aimed at helping in building a security management infrastructure inside the organization
5.2 Confidentiality & Integrity	5.2.1. General	5.2.1.1	Know main aspects: confidentiality, integrity, authenticity privacy and non-repudiation.
		5.2.1.2	Know principles and main characteristics of encryption in enforcing confidentiality.
		5.2.1.3	Know how to use encryption mechanisms to achieve authenticity
		5.2.1.4	Be aware of the usage of hashing and digest making in enforcing authentication.
		5.2.1.5	Know main aspects of electronic signature in enforcing non-repudiation and authentication.
		5.2.1.6	Know role played by structure in security.
		5.2.1.7	Know what are the main standardization bodies and their role.
		5.2.1.8	Know role played by open source in enforcing cryptography availability and robustness.
	5.2.2. Symmetric encryption	5.2.2.1	Be aware of principles of symmetric encryption.
		5.2.2.2	Know main encryption standards and their main differences (DES, 3DES, ...)
	5.2.3. Asymmetric encryption	5.2.3.1	Be aware of principles of asymmetric encryption.
		5.2.3.2	Know main public-key standards
	5.2.4 Comparison between encryption methods	5.2.4.1	Know the main advantages and disadvantages of symmetric and asymmetric encryption.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
		5.2.4.2	Be able of distinguish various level of security and their respective weight
	5.2.5 Management	5.2.5.1	Be aware of the usage of cryptography to protect data in e-commerce and e-banking.
		5.2.5.2	Be aware of the usage of digital signature to enforce non-repudiation in e banking and e-mail.
		5.2.5.3	Be aware of the legal aspects of digital signature, also with respect to European Community rules.
		5.2.5.4	Be aware of the usage of smartcards.
	5.2.6 Usage	5.2.6.1	Know working principles of SSH.
		5.2.6.2	Be able to install a software product that manages ssh protocol.
		5.2.6.3	Be able to produce keys using a product that manages ssh protocol.
		5.2.6.4	Be able to insert public keys in server to allow secret-key owner to manage them.
		5.2.6.5	Know main working aspects of PGP.
5.3 Authentication	5.3.1.General	5.3.1.1	Know different authentication schemes.
	5.3.2.Passwords	5.3.2.1	Know principles of password management.
5.4 Availability	5.4.1 General	5.4.1.1	Know different types of information availability (UPS, back-up, etc)
		5.4.1.2	Be able to implement effective back-up procedures (local and network)
5.5 Malicious Code	5.5.1. Programs	5.5.1.1	Know what can command a computer: programs, shells, macros.
		5.5.1.2	Know how GUI can recognize what action is to be performed on an icon using MIME type

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			and extension.
		5.5.1.3	Know how mail client programs can recognize what action is to be performed on an icon using MIME type and extension.
		5.5.1.4	Know how applications can handle more than text to perform various OS commands using macros.
		5.5.1.5	Know the doors from which a computer can be accessible: floppy, cdrom, emails, web browsing, chat clients.
		5.5.1.6	Know how people can maliciously use MIME types and how to defend their PC from them.
		5.5.1.7	Know how people can maliciously use macros and how to defend their PC from them.
		5.5.1.8	Know what can be considered good practice in Internet access.
	5.5.2 Viral Software	5.5.2.1	Know basic categories of viral software (trojan, virus, worms, etc)
		5.5.2.2	Know anti-virus program main working principles.
		5.5.2.3	Know email-antiviruses' main working principles.
		5.5.2.4	Be aware of limits and dangerousness of anti virus programs.
		5.5.2.5	Be able to install an anti virus program.
		5.5.2.6	Be able to update data of an anti virus program.
		5.5.2.7	Be able to use an anti virus program.
		5.5.2.8	Know what can be considered good practice in securing and using a workstation.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
5.6 Public Key Infrastructure	5.6.1 Directory services	5.6.1.1	Know LDAP server.
		5.6.1.2	Be able to use a browser to query an LDAP server to obtain data belonging to a particular Distinguish Name.
		5.6.1.3	Know the meanings of Common Name, Distinguish Name, and Attribute.
		5.6.1.4	Know the meanings of X509.
	5.6.2. PKI	5.6.2.1	Be aware of public-keys distribution problem, even in relation with owner identification issue.
		5.6.2.2	Know the meanings of Certificates and Certificate Revocation Lists.
		5.6.2.3	Know the X.509.V3 Certificates.
		5.6.2.4	Know what PKI means and its principal components, as Registration Authority and Certification Authority.
		5.6.2.5	Be able to use a browser to generate keys and certification request to a CA.
		5.6.2.6	Be able to import and export a certificate into a browser.
		5.6.2.7	Be able to access a CRL from a browser, be able to use Online Certificate Status Protocol
		5.6.2.8	Be able to import a CRL into a browser, be able to use Online Certificate Status Protocol
5.7 Network Security	5.7.1. Basic Telecommunication Concepts	5.7.1.1	Be aware of analog and digital communications. Know the basic concepts of ISO/OSI security architecture.
		5.7.1.2	Know the difference of continuous and packet communications.
		5.7.1.3	Know how Ethernet works (MAC address, CSMA/CD).

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			CSMA/CD).
		5.7.1.4	Understand main aspects of TCP/IP (Addresses, port numbers, main flow of operations).
		5.7.1.5	Know TCP/IP encapsulation in Ethernet.
		5.7.1.6	Understand network services as done in TCP/IP environment.
		5.7.1.7	Be able to install and operate a network analyser.
	5.7.2. Services	5.7.2.1	Be aware of services as access points of servers.
		5.7.2.2	Know the minimum and safest set of services that can be enabled on Internet servers.
		5.7.2.3	Know the set of services that are usually enabled on non-internet servers.
		5.7.2.4	Be aware of main type of wicked usage: abusive usage, denial of service, data falsification, ...
		5.7.2.5	Be aware of usual authentication schemes and their vulnerability.
		5.7.2.6	Be aware how weakness of protocols or software can be exploited on servers.
		5.7.2.7	Be aware of the fact that clients can be as vulnerable as servers.
		5.7.2.8	Know spoofing and how to limit it in its various flavours (IP, ARP, email,...)
		5.7.2.9	Know denial of services and how to limit it.
		5.7.2.10	Be aware of possible countermeasures.
		5.7.2.11	Know what can be considered good practice in securing and using a non-internet server.

CATEGORY	KNOWLEDGE AREA	REF.	KNOWLEDGE ITEM
			in securing and using a non-internet server.
		5.7.2.12	Know what can be considered good practice in securing and using an internet server.
	5.7.3. Access control	5.7.3.1	Be aware of how network authentication works and how to manage it.
		5.7.3.2	Be aware of cryptographic key based network authentication and how to manage it.
		5.7.3.3	Know domain-based authentication.
	5.7.4 Web services access control	5.7.4.1	Know differences between secure and non-secure web sites.
		5.7.4.2	Be able to implement a secure version of anon-secure web site generating keys and certification request and inserting keys and certificates.
		5.7.4.3	Be able to configure a web site to use plain text password to manage client identification and authorization.
		5.7.4.4	Be able to configure a web site to use certificates to manage client identification and authorization as in SSL V.3.
		5.7.4.5	Know what kinds of access on a directory's objects can be restricted in web sites.
		5.7.4.6	Be able to apply correct access restrictions on a given website directory.
	5.7.5. Email services access control	5.7.5.1	Be able to set up plain password authenticated access on POP and IMAP services.
		5.7.5.2	Be able to set up cryptographic certificate authenticated access on POP and IMAP services.
		5.7.5.3	Be able to set up cryptographic tunnel access on POP and IMAP services.

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	5.7.6 Firewalls	5.7.6.1	Know what a firewall is, its limits and potentials, different firewall architectures (gateways, circuits etc)
		5.7.6.2	Be aware of term DeMilitarized Zone.
		5.7.6.3	Know what is a proxy and how it works
		5.7.6.4	Be aware of usage of a proxy to both save IP addresses and secure internal network.
		5.7.6.5	Know what is and how works Network Address Translation (NAT).
		5.7.6.6	Know IP firewall principles in restricting IP services access.
		5.7.6.7	Know proxy firewall principles in restricting and securing protocol handling.
		5.7.6.8	Be able to install a firewall and a proxy server and implement a security policy.
		5.7.6.9	Be able to hide IP-addresses using a firewall.
		5.7.6.10	Be able to set up NAT on a firewall.
		5.7.6.11	Be able to set up access control rules on a firewall.
	5.7.7. Intrusion Detection	5.7.7.1	Know basic categories of intrusion detection systems.
		5.7.7.2.	Know how to monitor security logs and events.
5.8 Data Protection	5.8.1 Basic concepts	5.8.1.1	Know what is meant by the terms privacy, anonymity, pseudonymity .
		5.8.1.2	Know Data Protection Legislation (European 95/46 Directive) and what it implies in personal data processing.

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	5.8.2 PETs	5.8.2.1	Know the balance between authentication and privacy
		5.8.2.2	Know privacy enhanced technologies (PETs) categories
		5.8.2.3	Know cookies and how to manage them. (enable – disable cookies)
		5.8.2.4	Be able to install and manage a cookie buster program.
5.9 Social and Ethical Aspects of Computer Security	5.9.1 General	5.9.1.1	Know ethical issues (monitoring in the job, surveillance)
		5.9.1.2	Know basic deontology codes and code of Ethics (case studies: ACM, BCS, IEEE, etc)
		5.9.1.3	Know basic aspects of hacker ethics
		5.9.1.4	Know basic forms of computer crime
		5.9.1.5	Know basic mailing-lists and URLs concerning all above security areas.